MST Program

Application

Courses

ASTR502

ASTR503

ASTR530

PHYS501

Requirements

Workshops

Programs for Teachers

Needs Surveys

Survey Results

Courses for Teachers

Online Courses

Mailing lists

Rice Education Sites

Center for Education

K-12 Initiatives at Rice

Rice School Mathematics Project

Office of STEM Engagement

Teacher Education at Rice

Links

Rice Physics & Astronomy

Rice Space Institute

Space Science Outreach
[space.rice.edu]

The Public Connection
[earth.rice.edu]

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ASTR 530 : Teaching Astronomy Laboratory

DESCRIPTION | OVERVIEW | LEARNING GOALS | CLASS DETAILS | SCHEDULE | HOMEWORK | OBSERVING

Spring 2021 (STARTING JAN 25, CRN 25751)

DESCRIPTION

Methods and facilities of observational astronomy for public education. Includes training in telescopes, astronomical binoculars, portable planetariums, telescopes, digital cameras, photography (still, 3D, and time lapse). Students will help train beginners in the use of telescopes and carry out a modest observational program. The course requires one public presentation and internship work. Topics may vary with each offering.

Note - for 2021 we may be less "hands-on" for COVID safety. We will try to accommodate remote learners. Visiting and MST teachers must attend (virtually ok) at least one session before class starts to fill our registration forms.

Prerequisite(s): Any of: ASTR 230, ASTR 350, ASTR 360, ASTR 402, 403, 502, or 503 or permission of instructor. (Note: undergraduates considering a formal or informal teaching career may enroll. Contact instructor for registration waiver.)

OVERVIEW

This course introduces teachers (inservice or preservice) to the fundamentals of astronomical hardware and software, including telescopes, binoculars, sky software, spectroscopy, digital cameras, movie-making, CCD imagery, planetariums, etc.

LEARNING GOALS

As a result of this class, the student will be able to:
1. set up, align and operate manual and computerized telescopes and astronomical binoculars.
2. (Communication) teach others how to use a telescope safely.
3. compute the magnification of a telescope from the focal length of the objective and the eyepiece, and perform other calculations relative to image size and brightness.
4. make an anaglyph 3D stereo image.
5. make a stop-action time lapse movie.
6. use filters for safe solar observations, and (Communication) to demonstrate safe techniques to others.
7. create an observational project that is suitable for the level of their own students (e.g. middle school, high school), and demonstrate to the class.
8. set up and operate a portable planetarium.
9. (Note - goals may vary for 2021 to be less hands-on for COVID safety).

CLASS DETAILS

Instructor	Prof. Patricia Reiff (reiff@rice.edu), with special activities by Adjunct Prof. Carolyn Sumners of the Houston Museum of Natural Science.
Classroom	HBH 223, 6:00 - 9 pm MONDAYS starting January 25, plus observatory (BRK400), planetarium (BRK250) and lab sessions TBD Also used: Oncampus Observatory, HMNS Planetarium, George Observatory and HBH 254. One overnight at George Observatory if it can be arranged.
Text	"Space Update" DVD-Rom ($10) and other handouts.
Strongly recommended:	Personal laptop and "Stellarium" (free planetarium software from stellarium.org). Also very helpful: headlamp with red/white LED light; good quality binoculars.
Grading:	Roughly 120 points possible. Two take-home exams each counting 30 points, plus around 60 points for homework. No comprehensive final exam.
Students With Disabilities	Any student with a disability requiring accommodations in this course is encouraged to contact me after class or during office hours. Additionally, students will also need to contact Disability Support Services in the Allen Center. Students will need to climb a few steps to use the 16 inch

telescope but may use the smaller scopes without climbing.

SCHEDULE : SPRING 2021 (WILL BE UPDATED)

DATE AND LOCATION	MATERIAL
January 18, HBH 223	Orientation and filling out of forms. (Visiting teachers must register before the first official class) Downloading and installing Stellarium and Space Update. Bring your laptop to class each week.
January 25, HBH 223	Install Stellarium and Space Update. Celestial coordinates: alt/az; RA/Dec. Homework 1 out.
Feb 1, HBH 223	Kinds of telescopes: refractors, reflectors. Parts of a telescope. Calculations of image size and brightness based on focal lengths and objective size. Visit the campus observatory to practice setting up the telescopes.
Feb 8, HBH 223 **5 pm**	At Burke Baker Planetarium with Dr. Sumners.
Feb 15	At observatory: setting up and aligning the 8 inch and 16 inch telescopes. Observing session.
Feb 22, HBH 223	Digital Cameras: Bring your digital camera (preferably a SLR with manual settings). We will discuss techniques of astrophotography, f numbers, etc. We will demonstrate how to set up for the 3D image taking (homework 3) and the time lapse photography (homework 2). Using special modes on cameras: when to use "portrait" mode, "sports" mode, "landscape" mode etc. More on f numbers.
Mar 1, HBH 223	the Sun and safe solar observing.
March 8, HBH 223	TBD
March 15, HBH 223	Equinox at HMNS; Solar eclipses: alignment, special filters. Safe observing techniques. Solar observing at BRK 400: use of sunspotters and h-alpha telescopes.
Mar 22, HBH 223 then BRK 250	Portable planetarium: how to set up and use.
Mar 29, HBH 223	History of the telescope. Saving the dark. lenses and the basics of CCD imagery.
April 5	(If clear: help with solar telescope (H-alpha) and "sunspotter" solar projection device. If not clear: help with planetarium show setup and operation. (Homework 6).
April 12, HBH 223	CCD imaging exercise
April 19, HBH 223	Class presentations: show the others in the class the observing project you will do with your students. (Homework 5). Final quiz review.

HOMEWORK (Spring 2021 (tentative))

- **Homework 1**: Stellarium Activity
- **Homework 2**: Making a time lapse movie
- **Homework 3**: Stereo imaging
- **Homework 4**: Calculations of image brightness and magnification for telescopes, cameras and binoculars
- **Homework 5**: Educational Project: Create an observing project that you might use with your students and demonstrate it to our class.
- **Homework 6**: Public Education Project:
- **Homework 7**: Observing Project:
  Demonstrate ability to align telescopes and observe six objects.
- **Homework 8**: (CCD imaging): (if time permits).

OBSERVING PROJECT (Spring 2021 (tentative))

Observe at least 6 solar system or deep sky objects. Draw a sketch using the **JPG** or **PDF** observing form, being sure to note location, telescope used, etc. Try to determine by using star charts what the "limiting magnitude" is at the time of the observation (the dimmest star you can see). Make the circle on the page equal the FIELD OF VIEW of the telescope/eyepiece combination. (For visual observations note the angular size of the FOV of your sketch).

If the Moon is visible, use its size in your field of view to estimate the field of view of the eyepiece by seeing how many Moons fit across the field of view.

Find out how far away the Moon was the day you observed. Use its physical size and its distance to get its angular diameter; from

that you should be able to calculate the field of view. (You can check against the chart on the wall for the FOV of the various eyepieces on the 16 inch)

We will make at least one astronomical CCD and/or spectroscope image. We will look for colors of clusters, motion of asteroids, etc.

There will be at least three evening sessions, including all Rice "Observatory Open Houses". We will participate in at least one remote observing session.

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